



Mobile WiMAX Business Case

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Propose Two (or more) White Papers

- Phase I Paper– “A Comparative Analysis of Mobile WiMAX Deployment Alternatives”
 - Would look at different deployment alternatives on the basis of number of BS required to meet specific capacity requirements in hypothetical metropolitan area
 - SIMO, MIMO, Beamforming, & Beamforming+MIMO
 - Reuse 1 vs. Reuse 3
 - 700 MHz, 2500 MHz, 3500 MHz
 - Sensitivity to link budget
 - TDD only (for now)
 - Phase I paper:
 - Will not require core network CAPEX or detailed service provider OPEX
 - Will not provide payback or detailed ROI
 - This detail will be provided in a follow-on, Phase II paper

Key Requirements for Phase I Paper

- Estimate of “Peak Busy Hour” downlink capacity requirements
- Validation of DL channel capacity for various BS and Reuse configurations
- Estimate of average WiMAX equipment costs

These are key discussion points for today’s discussion

Goal: To arrive at some consensus on numbers and methodology

Peak Busy Hour DL Capacity Requirements

- Assume Three Classes of Customers
 - Professional: Heavy user, business applications, large files, office on the move, etc.
 - High-End Consumer: messaging, gaming, etc.
 - Casual Consumer: Light user, voice, e-mails, messaging, some internet browsing, etc.
- DL Capacity Calculation
 - Users are either “Actively” connected to the network or in “Sleep” mode
 - “Actively” connected users are either downloading, uploading, or in “idle” mode, i.e. Reading, Typing, or thinking of next action

Peak Busy Hour DL Capacity Estimates & Methodology

Customer Class	Customer Density	Number Actively Connected During PBH	DL "Duty Cycle"	"Guaranteed" DL Data Rate during PBH
Professional	"a" per sq-km	1 of 5 (20%)	25%	25 kilobytes/sec (200 kbps)
High-End Consumer	"b" per sq-km	1 of 10 (10%)	25%	20 kilobytes/sec (160 kbps)
Casual User	"c" per sq-km	1 of 20 (5%)	25%	10 kilobytes/sec (80 kbps)

Reasonable?

Relative Downlink Channel Capacity Estimates

BS Configuration	Frequency Reuse = 1	Frequency Reuse = 3
1x2 SIMO	1.0	1.5
2x2 MIMO	1.5 ¹	2.3
Beamforming	3.0 ²	3.0
Beamform + MIMO	5.0 ²	5.0

1. Based on simulations done for paper “Mobile WiMAX – Part II: A Comparative Analysis”
2. Based on inputs from equipment vendor

Assumed Average WiMAX Equipment Costs

3-Sector WiMAX Base Station (Excluding installation cost)		
BS Configuration	1-Channel (i.e. Reuse 1)	3-Channel (i.e. Reuse 3)
1x2 SIMO	\$37K	\$47K
2x2 MIMO	\$49K	\$59K
Beamform	\$55K	\$65K
Beamform + MIMO	\$79K	\$89K

Assume \$7.5K per sector for installation

Numbers need validation:
Too high, Too low, or About right?
For comparative analysis cost differential is most important



Example: Using Current Estimates

- 2500 MHz Band
- 500 sq-km Metro Area
- 100,000 Customers
 - 46,000 Professional
 - 37,000 High-End Consumer
 - 17,000 Casual Consumer
- Greenfield BS at \$200K + WiMAX Equipment

BS Conf	Channel BW	Available Spectrum	Reuse	Total BS	Total WiMAX BS Equip \$M	Relative WiMAX Equip Cost	Total BS Related CAPEX \$M	Relative BS Related CAPEX
1x2 SIMO	10	30	3	247	\$ 17.2	100%	\$ 66.6	100%
2x2 MIMO	10	30	3	227	\$ 18.5	108%	\$ 63.9	96%
Beamform	10	30	3	154	\$ 13.5	78%	\$ 44.3	67%
MIMO+BF	10	30	3	116	\$ 12.9	75%	\$ 36.1	54%

Follow-on Mobile WiMAX Business Case Paper(s)

- Phase II paper(s) would provide more detailed financial analysis (payback, ROI, etc) for various scenarios:
 - Greenfield operator
 - 3G or 2G overlay
 - Wireline extension
- Requires service provider inputs for:
 - Core network cost estimates
 - OPEX estimates
 - ARPU projections

Next Steps

- Proceed with Phase I Business Case White Paper
 - With current or modified estimates for PBH calculations, channel capacity, and WiMAX equipment costs
 - Consider an FDD vs. TDD comparison (if there is sufficient interest)
- Continue to engage with willing service providers to collect additional data required for Phase II paper(s)

Thank You!



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